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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,507	07/29/2003	Kuo-Chien Wu	WUKU3005/EM	5074
23364	7590	04/02/2004	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			NOVACEK, CHRISTY L	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 04/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/628,507

Applicant(s)

WU ET AL.

Examiner

Christy L. Novacek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the communication filed July 29, 2003.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: “31” and “32” as shown in Figure 3. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Dennison (US 6,696,355).

Regarding claim 1, Dennison discloses forming a plug (230/250) in an oxide layer (210), removing some of the oxide layer to make the plug protrude, oxidizing an exposed region of the protruding plug to form an oxidized portion and removing the oxidized portion (Fig. 10-14; col. 5, ln. 50 – col. 8, ln. 67).

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Regarding claim 2, Dennison discloses forming a first dielectric layer (242) on the plug and having the upper surface of the plug exposed. (Fig. 12a, 13 and 14; col. 7, ln. 36 – col. 8, ln. 66).

Regarding claims 3 and 6, Dennison discloses planarizing the first dielectric layer (242) after it is formed (col. 8, ln. 63-66).

Regarding claim 4, Dennison discloses forming a plug (230/250) in an oxide layer (210), removing some of the oxide layer to make the plug protrude, oxidizing an exposed region of the protruding plug to form an oxidized portion, removing the oxidized portion of the plug, forming a first dielectric layer (242) on the upper surface of the entire structure such that the upper surface of the plug is exposed, forming a second dielectric layer (330) on the upper surface of the first dielectric layer including the upper surface of the plug, and forming a conducting wire (340/350) in the second dielectric layer (Fig. 10-16; col. 5, ln. 50 – col. 10, ln. 31).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (US 6,696,355) in view of Avanzino et al. (US 5,795,823).

Regarding claim 5, Dennison discloses forming an opening in the second dielectric layer and filling the opening with metal so as to form the conductive wire, but Dennison does not disclose the specific process for forming the conductive wire. Instead Dennison states,

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“Techniques for introducing dielectric material 330, forming and filling conductive vias, and planarizing are known to those skilled in the art.” Like Dennison, Avanzino discloses forming a conductive wire in a dielectric layer. Avanzino states that the openings for the wire can be formed in the dielectric layer by coating a photoresist on the dielectric layer, forming an opening of a predetermined pattern in the second dielectric layer by exposing, developing and etching, and filling metal in the opening to form a conducting wire (Fig. 3a-4p; col. 5, ln. 13 – col. 7, ln. 40). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the via-etching method of Avanzino to create the via opening of Dennison because Dennison states that conventional processes known in the art should be used to form the opening and Avanzino discloses one such successful method.

Regarding claims 7 and 8, Dennison discloses that layer 242 (the “first dielectric layer”) is a dielectric but does not disclose from what material the layer is made. Dennison discloses that the layer 330 (the “second dielectric layer”) can be made of “for example, SiO₂ or other suitable material”. Like Dennison, Avanzino discloses forming a conductive wire in dielectric layers. Avanzino teaches that a conductive wire can be formed in a dielectric layer of one continuous type of dielectric by using a timed etch to form the via/trench that the wire material will fill (Fig. 3a-3e). As such, the efficiency of the wire forming process is improved by precluding the need for different dielectric layers to be deposited. Avanzino teaches that in addition to the previous method, the conductive wire may also be formed by using different dielectric layers stacked upon one another (Fig. 4a-4p). In this way, the etching selectivity between the layers can be used to precisely etch the trench/via without need for a timed etch. As such, the quality of the wire forming process is improved by offering a more precise trench/via etch. At the time of the invention, it would have been obvious to one of ordinary

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skill in the art to form the first and second dielectric layers of Dennison either of both the same material (in the event that efficiency of the conductive wire formation process is more important than the quality) or to form the first and second dielectric layers of two different materials (in the even that the quality of the conductive wire is more important than the efficiency of the process).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
March 25, 2004


AMIR ZARABIAN
SUPPLEMENTARY PATENT EXAMINER
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